

Technology Opportunity

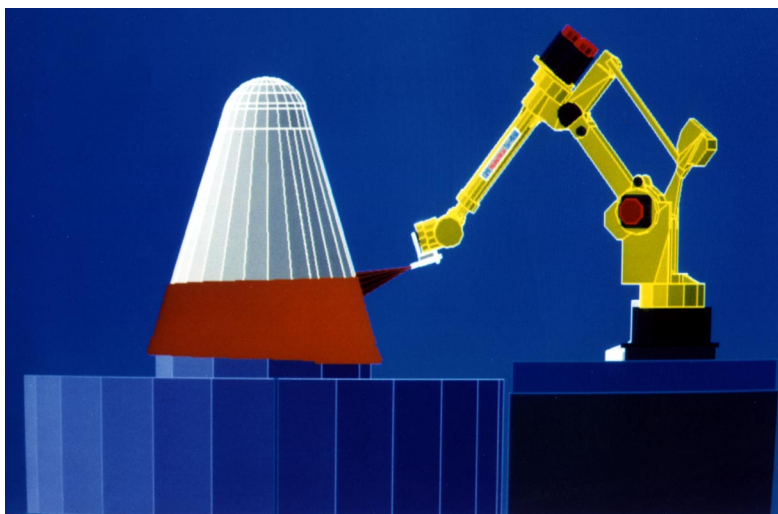
Productivity Enhancement Complex at Marshall Space Flight Center (MSFC)



The Productivity Enhancement Complex (PEC) is operated by the Materials and Processes Laboratory at MSFC. Here, NASA and industry work together to develop new materials, processes, and assembly techniques.

The PEC is the focal point for cooperative research activities between MSFC and its contractors. These partnership efforts provide valuable benefits such as reduction of program costs, promotion and exchange of new ideas, and validation of new materials and processes.

The PEC can evolve along with new technologies. With more than 40 research cells, the PEC can accommodate a variety of activities such as creating or modifying computer programs for industrial robots used in welding processes, manufacturing space-age composite materials, vacuum plasma spray techniques, rapid prototyping, and cryogenic insulation development.

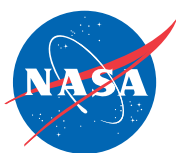


Potential Commercial Uses

NASA encourages collaboration efforts between NASA and industry to develop advanced manufacturing techniques. Manufacturing process improvements can be designed and tested using the unique capabilities of the PEC. Industries associated with the automotive, commercial airline, medical, and air conditioning and refrigeration have already taken advantage of the capabilities of the PEC.

Benefits

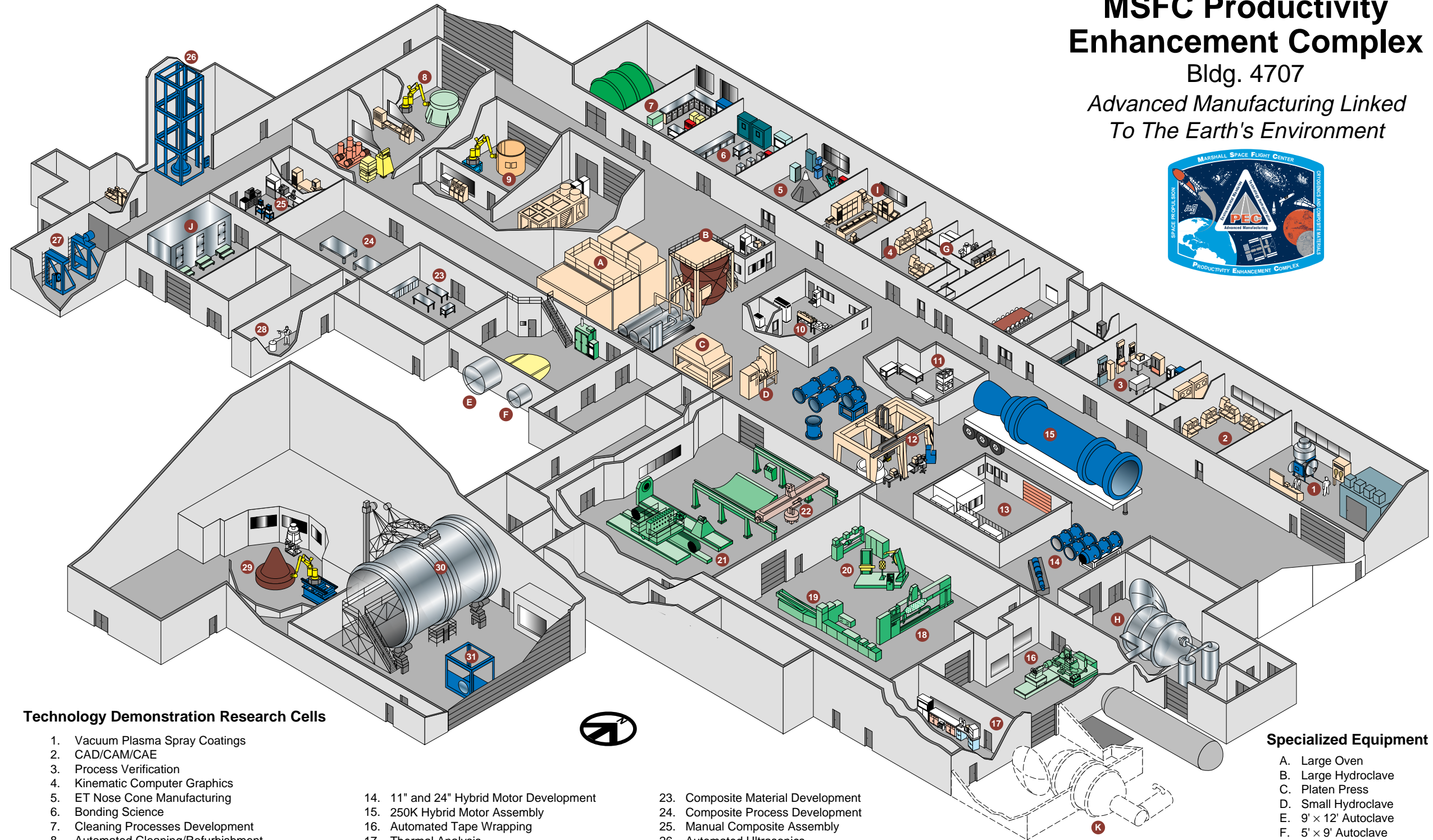
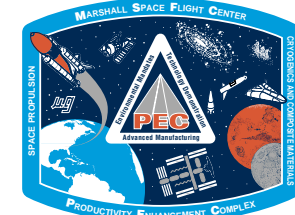
Enhancements in welding, rapid prototyping, insulation, composites, metallic coatings, and environmentally friendly cleaning techniques will result in savings of both time and money for U.S. industries. Startup costs, design, development, and testing can be done faster and cheaper by combining cutting-edge technology with current industry needs.



MSFC Productivity Enhancement Complex

Bldg. 4707

*Advanced Manufacturing Linked
To The Earth's Environment*



Technology Demonstration Research Cells

- | | | |
|---|--|------------------------------------|
| 1. Vacuum Plasma Spray Coatings | 14. 11" and 24" Hybrid Motor Development | 23. Composite Material Development |
| 2. CAD/CAM/CAE | 15. 250K Hybrid Motor Assembly | 24. Composite Process Development |
| 3. Process Verification | 16. Automated Tape Wrapping | 25. Manual Composite Assembly |
| 4. Kinematic Computer Graphics | 17. Thermal Analysis | 26. Automated Ultrasonics |
| 5. ET Nose Cone Manufacturing | 18. Helical Filament Winding | 27. Computed Tomography |
| 6. Bonding Science | 19. Pultrusion | 28. Paint Technology |
| 7. Cleaning Processes Development | 20. Polar Filament Winding | 29. Sprayable Ablator |
| 8. Automated Cleaning/Refurbishment | 21. Fiber Placement | 30. Tank Welding Application Tool |
| 9. Cryogenic Insulation Process Development | 22. 3-D Automated Tape Laying | 31. Hatch Life Cycle Test Fixture |
| 10. Rapid Prototyping/Stereo Lithography | | |
| 11. International Space Station Rack Assembly | | |
| 12. Gantry Robotics | | |
| 13. Subscale Solid Rocket Motor Development | | |

Specialized Equipment

- A. Large Oven
- B. Large Hydroclave
- C. Platen Press
- D. Small Hydroclave
- E. 9' x 12' Autoclave
- F. 5' x 9' Autoclave
- G. Video Documentation Center
- H. Optical Lens Coating Chamber
- I. Central Manufacturing Information System
- J. Refrigerated Storage
- K. Proposed Autoclave

The Technology

Robotics are used to produce precise motion control, while allowing great flexibility of the path to be traced. Using commercially available industrial robots with advanced feedback sensors, engineers have the flexibility necessary to support testing of improved processes under a variety of conditions, simulating how the process might be applied to a manufacturer's facility. Applications include robotic waterblasting and welding.

The PEC's welding research cells are used for developing new welding techniques. NASA has developed methods for welding new aluminum-lithium alloys for lightweight tanks, high strength steel alloys for rocket motor cases, and high-nickel alloys for liquid fuel rocket engine applications. Friction stir welding and plasma arc welding techniques, as well as imaging, sensor and control mechanisms have also been developed.

Composites are generally less prone to corrosion and less sensitive to crack formation than metals, and their strength-to-weight ratio is significantly greater than conventional metals. The PEC contains precision automated composite fabrication systems that can work with many different materials, including glass, Kevlar, and carbon/graphite fibers. Process characterization, sensitivity studies, materials performance and weight saving studies, EPA/OSHA-compliance investigations, and advanced materials assessments are given high priority.

New coatings have resulted from enhanced performance requirements and national health, safety, and environmental interests. In compliance with EPA standards, alternatives are being developed that may replace anticorrosion coatings for metal surfaces and weatherized coatings. Evaluations are made for adhesion characteristics, corrosion-inhibiting capabilities, case of application, and durability.

Insulation research cells are dedicated to improving performance and reducing the environmental impact of insulating material. They are also critical for qualifying both new foam formations and new commercial suppliers of flight materials. Activities include the development of lightweight, environmentally compatible insulating foams and the design and development of improved foam application systems.

■ Contacts

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Additional information about the Productivity Enhancement Complex, NASA's Technology Transfer Program, and a Technology Transfer Agreement are available on the World-Wide Web:

<http://techtran.msfc.nasa.gov>

Key Words

Productivity	Insulation	Application Systems
Manufacturing	Coatings	Composites
Technology Transfer	Welding	Metal Processes
EPA	NOET	Foam

